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## PATENT ABSTRACTS OF JAPAN

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### (54) ACCELERATION SENSOR

#### (57)Abstract:

PURPOSE: To obtain an inexpensive acceleration sensor which requires no excessively high size accuracy to realize a proper dumping function with a simple structure.

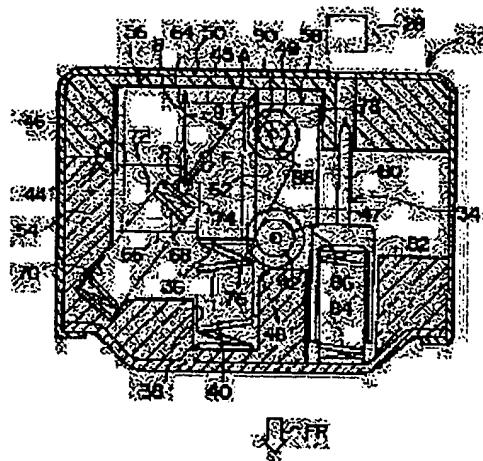
CONSTITUTION: When an inertial body 56 linearly moves by inertia upon receipt of an acceleration, the inertial moving amount of the inertial body 56 is increased, and accordingly a crossing angle 6 of an anti-inertial moving direction B and an urging direction A of an urging force F generating a component of force R in the anti-inertial moving direction B to resist the inertial movement is enlarged. The component of force R in the anti-inertial moving direction is large when the inertial moving amount of the inertial body 56 is small, whereas it is gradually decreased as the inertial moving amount is increased. In consequence, the inertial body 56 does not attain a predetermined inertial moving amount to actuate an air bag device at an acceleration of a short working time to the inertial body when a vehicle runs a bad road or the like. However, the inertial body 56 reaches the predetermined

inertial moving amount at an acceleration of a long working time due to the sudden deceleration of the vehicle because of tone necessity to actually drive the air bag device, so that a dumping function to decelerate the inertial body 56 is positively exerted.

### CLAIMS

#### [Claim(s)]

[Claim 1] The inertial field which inertia migration is carried out [inertial field] and starts occupant crash protection with predetermined inertia movement magnitude according to an acceleration operation at the time of a car sudden slowdown, While producing the component of a force which exerts the energization force which makes the energization direction the anti-inertia



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migration direction of an inertial field, and the crossing direction on this inertial field, and resists inertia migration of an inertial field in the anti-inertia migration direction of an inertial field based on the energization force. The acceleration sensor characterized by having an energization means by which whenever [ crossed-axes-angle / to make / of the energization direction of the energization force and the anti-inertia migration direction of an inertial field which attain to an inertial field according to the inertia movement magnitude of an inertial field becoming large ] becomes large.

## DETAILED DESCRIPTION

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### [Detailed Description of the Invention]

#### [0001]

[Industrial Application] An inertial field carries out inertia migration according to an acceleration operation, and this invention relates to the acceleration sensor which starts occupant crash protection with predetermined inertia movement magnitude at the time of a car sudden slowdown.

#### [0002]

[Description of the Prior Art] Air bag equipment is known as occupant crash protection of a car. [0003] It is used in order, as for air bag equipment, for crew to be taken care of by the bag body with which the bag body bulged and bulged at the time of a car sudden slowdown and for an acceleration sensor to start air bag equipment.

[0004] In an acceleration sensor, if it is held in a cylinder, a ball being used as an inertial field and acceleration acts on a ball conventionally, a ball will carry out inertia migration of the inside of a cylinder. At the time of a car sudden slowdown, based on the predetermined inertia movement magnitude of the ball, a firing pin moves towards a detonator, and if a firing pin contacts a detonator, a detonator will be lit. By firing of this detonator, the generation-of-gas matter burns, gas occurs, generating gas is supplied in a bag body, and swelling of the bag body is carried out.

[0005] Here, between the inner skin of a cylinder, and the peripheral face of a ball, if the gap is formed and a ball carries out inertia migration, in that gap, air will flow from the inertia migration direction front of a ball relatively [ ball ] to back, and the slowdown resistance which decelerates a ball by the flow of this air, and the so-called damping resistance will arise. According to this, with the short acceleration of the acceleration reaction time which acts on a ball by the oscillation at the time of a car running a bad road etc. A ball does not reach the predetermined inertia movement magnitude which migration of a firing pin takes. On the other hand With the long acceleration of the acceleration reaction time which acts on a ball, a ball reaches the predetermined inertia movement magnitude which migration of a firing pin takes, and a proper damping function is obtained by the car sudden slowdown which needs to start air bag equipment truly in order to take care of crew.

#### [0006]

[Problem(s) to be Solved by the Invention] By the way, if it is in the above-mentioned conventional acceleration sensor, the magnitude of the inner skin of a cylinder and the gap between balls influences the magnitude of damping resistance. Therefore, in order to obtain a proper damping function, the above-mentioned gap is asked for close dimensional accuracy. This has troublesome manufacture and it is the object to offer the cheap acceleration sensor which does not require close dimensional accuracy too much although this invention which also causes lifting of a manufacturing cost obtains a proper damping function in consideration of the above-mentioned data, but is sufficient for it with easy structure.

#### [0007]

[Means for Solving the Problem] The inertial field which inertia migration is carried out [ inertial field ] and starts occupant crash protection with predetermined inertia movement magnitude

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according to an acceleration operation at the time of a car sudden slowdown in order that this invention may solve the above-mentioned technical problem, While producing the component of a force which exerts the energization force which makes the energization direction the anti-inertia migration direction of an inertial field, and the crossing direction on this inertial field, and resists inertia migration of an inertial field in the anti-inertia migration direction of an inertial field based on the energization force The acceleration sensor characterized by having an energization means by which whenever [ crossed-axes-angle / to make / of the energization direction of the energization force and the anti-inertia migration direction of an inertial field which attain to an inertial field according to the inertia movement magnitude of an inertial field becoming large ] becomes large is proposed.

[0008]

[Function] According to the acceleration sensor concerning this invention, based on the energization force which attains to an inertial field with an energization means, component of a force arises in the anti-inertia migration direction of an inertial field, and inertia migration of an inertial field is resisted by this component of a force.

[0009] The ratio to the energization force of the anti-inertia migration direction component of a force is determined by whenever [ crossed-axes-angle / to make / of the energization direction of the energization force, and the anti-inertia migration direction ], and becomes so small that whenever [ this crossed-axes-angle ] becomes large.

[0010] Since whenever [ that crossed-axes-angle ] becomes large according to the inertia movement magnitude of an inertial field becoming large, the ratio to the energization force of the anti-inertia migration direction component of a force becomes small according to the inertia movement magnitude of an inertial field becoming large, and the inertia migration resistance which this part that becomes small, and an inertial field receive is controlled according to the inertia movement magnitude of an inertial field becoming large.

[0011] consequently, with the short acceleration of the acceleration reaction time which acts on an inertial field by the oscillation at the time of being hard to carry out inertia migration and a car running a bad road etc., an inertial field at the beginning of inertia migration initiation The predetermined inertia movement magnitude which should start occupant crash protection cannot be reached. The predetermined inertia movement magnitude can be reached with the long acceleration of the acceleration reaction time which acts on an inertial field by the car sudden slowdown which needs to start air bag equipment truly on the other hand in order to take care of crew, and the damping function to slow down an inertial field is achieved proper.

[0012] Although a proper damping function is obtained, troublesome manufacture which asks the gap between an inertial field and a cylinder for close dimensional accuracy is not required, but easy structure is sufficient, and cheap-ization is achieved by this.

[0013]

[Example] The acceleration sensor concerning the 1st example of this invention is explained based on drawing 1 thru/or drawing 3 .

[0014] Air bag equipment 10 is shown in drawing 1 (an arrow head FR shows the car front). Air bag equipment 10 consists of an inflator 12, covering 14, and a bag body 16, and is attached in the base plate 22 supported by the hub 20 of a steering wheel 18.

[0015] An inflator 12 is made into the shape of a cylindrical shape which has a peripheral face in the circumference of the axis of rotation of a steering wheel 18, a base plate 22 is penetrated, and the part projects in the car back side (crew side) of a base plate 22.

[0016] A bag body 16 is formed in the condition of having been folded up at the crew side of a base plate 22, and it rushes into the crew side projection part of an inflator 12 into the bag body 16.

[0017] Covering 14 is formed in the shape of a bowl so that a bag body 16 may be stored between base plates 22. If a thin-walled part 24 is formed and a bag body 16 expands, a thin-walled part 24

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is fractured by the bottom wall of covering 14, and covering 14 can develop in a double mode opening outward to it.

[0018] An enhancer 26, a detonator 28, the generation-of-gas matter 30, and an acceleration sensor 32 are held in an inflator 12, at the time of a car sudden slowdown, the firing pin 34 by the side of an acceleration sensor 32 collides with a detonator 28, a detonator 28 is lit, by the firing, the generation-of-gas matter 30 is inflamed, gas occurs, and gas is supplied in a bag body 16 through the gas eye 34 of an inflator 12. Swelling of the bag body 16 is carried out towards crew by this, and crew is taken care of.

[0019] Here, it explains in full detail about an acceleration sensor 32. In the acceleration sensor 32, as shown in drawing 2, the support block 54 is arranged in housing 50, and the inertial field 56, the trigger member 58, and the firing pin 34 are supported by the support block 54.

[0020] between the location (location shown in drawing 2) where an inertial field 56 is made into the shape of a cylindrical shape which has a peripheral surface 62 in the circumference of a car cross-direction line, and the back end side (car back end face) 64 of an inertial field 56 contacts the support block 54, and the locations where the front end side (car front end face) 66 of an inertial field 56 contacts the support block 54 -- a straight line -- it is movable. An inertial field 56 will carry out inertia migration towards the car front, if the acceleration to the car front is received.

[0021] Between the support block 54 and the inertial field 56, the helical compression spring 68 which constitutes an energization means is formed across [ inertia migration direction front ] the inertial field 56. The elastic energization force F by the helical compression spring 68 has attained to the inertial field 56, this energization direction A having been used as the anti-inertia migration direction (car back) B of an inertial field 56, and the direction which crosses by theta whenever [ crossed-axes-angle ]. The end of a helical compression spring 68 gets into the crevice 70 formed in the support block 54, and is contacted by the bottom of a crevice 70, and the other end is stopped by the projection 74 which projected in the notching section 72 formed in the inertial field 56. Based on the energization force F by the helical compression spring 68, the component of a force (the anti-inertia migration direction component of a force R) which resists inertia migration of an inertial field 56 arises in the anti-inertia migration direction B of an inertial field 56. This anti-inertia migration direction component of a force R is acquired by  $R=F \cdot \cos \theta$ . If an inertial field 56 receives acceleration, resists the anti-inertia migration direction component of a force R and carries out inertia migration to the car front, according to inertia movement magnitude becoming large, theta will become large whenever [ above-mentioned crossed-axes-angle ] (refer to drawing 2).

[0022] Although the amount of cutbacks of a helical compression spring 68 becomes large and the energization force F by the helical compression spring 68 increases according to the inertia movement magnitude of an inertial field 56 becoming large, on the other hand, that ratio to the energization force F of the anti-inertia migration direction component of a force R is determined by theta whenever [ crossed-axes-angle / to make / of the energization direction A and the anti-inertia migration direction B ], and becomes so small that theta becomes large whenever [ this crossed-axes-angle ].

[0023] As shown in drawing 4, therefore, the inertia movement magnitude L of the anti-inertia migration direction component of a force R and an inertial field 56 By becoming large according to theta becoming large [ the inertia movement magnitude L of an inertial field 56 ] whenever [ above-mentioned crossed-axes-angle ] to the anti-inertia migration direction component of a force R serving as straight-line (dotted line showing)-relation which increases by the fixed ratio, if theta is [ whenever / above-mentioned crossed-axes-angle ] fixed The anti-inertia migration direction component of a force R serves as curve (continuous line shows)-relation which decreases after obtaining maximum.

[0024] In addition, while the lobe 36 which carried out amount projection a little is formed in the

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car front in a part of front end side 66 of an inertial field 56, the lobe 36 is countered, a crevice 38 is formed in the support block 54, and the helical compression spring 40 intervenes between the lobe 36 and the bottom of a crevice 38. The energization direction of the energization force by the helical compression spring 40 is not concerned with the inertia movement magnitude of an inertial field 56, but is made into the anti-inertia migration direction B. It is required to excel the energization force by the helical compression spring 40 by an inertial field 56 starting inertia migration, in order to continue inertia migration, and to excel the anti-inertia migration direction component of a force R based on the energization force by the above-mentioned helical compression spring 66.

[0025] The trigger member 58 is formed by the plate and installed in the car cross direction in accordance with the peripheral surface 62 of an inertial field 56. The end by the side of the car front of the trigger member 58 is supported to revolve with the pivot 76 which makes shaft orientations the inertia migration direction of an inertial field 56, and the direction which intersects perpendicularly by the support block 54, and can be freely rotated to the circumference of the pivot 76. The roller 78 is formed in the other end by the side of the car back of the trigger member 58 free [ a revolution ]. A roller 78 contacts the peripheral surface 62 of an inertial field 56, and rolling of the peripheral surface 62 of an inertial field 56 of it is attained with inertia migration of an inertial field 56. While according to the contact to the peripheral surface 62 of the inertial field 56 of a roller 78 the rotation to a counterclockwise rotation is prevented by drawing 2 of the trigger member 58 and a roller 78 rolls a peripheral surface 62, the rotation location of the trigger member 58 is maintained as it is. On the other hand, after the peripheral surface 60 of an inertial field 56 separates from a roller 78 by inertia migration of an inertial field 56, counterclockwise rotation is permitted by drawing 2 of the trigger member 58.

[0026] The firing pin 34 is made movable in car front location empty vehicle both the back location, and consists of the pin section 80 by the side of car back, and the flange section 82 by the side of the car front. A helical compression spring 84 is formed between the flange section 82 and the support block 54, and migration energization of the firing pin 34 is always carried out to car back. The engagement section 86 is formed in the above-mentioned trigger member 58 corresponding to the flange section 82. (The condition of drawing 2 ) and the engagement section 86 carry out contact engagement with the flange section 82, the roller 78 of the trigger member 58 opposes the energization force of a helical compression spring 84, where rotation of the counterclockwise rotation of the trigger member 58 is prevented in contact with the peripheral surface 62 of an inertial field 56, the firing pin 34 is held in a car front location, and migration to back is prevented. The peripheral surface 62 of an inertial field 56 separates from a roller 78, in the condition that rotation of the counterclockwise rotation of the trigger member 58 is permitted, with rotation of (the condition of drawing 3 ), and the counterclockwise rotation of the trigger member 58, engagement in the engagement section 86 and the flange section 82 is canceled, migration in a car back location is permitted based on the energization force of a helical compression spring 84, the head of the pin section 80 comes out of housing 50, and the firing pin 34 collides with a detonator 28.

[0027] In addition, the revolving shaft 88 of a roller 78 fits in in the long hole 90 of the shape of radii formed in the trigger member 58, and is movable along with the longitudinal direction of a long hole 90. [ of a roller 78 ] While the engagement section 86 is engaging [ the roller 78 ] with the flange section 82 in contact with the peripheral surface 62 of an inertial field 56, a roller 78 is located in the end of a long hole 90 according to the rotation energization force which the trigger member 58 receives based on the energization force of a helical compression spring 84. When the peripheral surface 62 of an inertial field 56 separates from a roller 78 with inertia migration of an inertial field 56, a roller 78 By slight inertia migration of the inertial field 56 after it begins to roll the back end side 64 of an inertial field 56, moving towards the other end of a long hole 90 and the peripheral surface 62 of an inertial field 56 separates from a roller 78 Or immediately after the peripheral surface 62 of an inertial field 56 separates from a roller 78, the trigger member 58 is

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rotated to the rotation location where engagement in the stop section 86 and the flange section 82 is canceled. Thereby, discharge of engagement in the stop section 86 and the flange section 82 is performed with sufficient moderation.

[0028] Moreover, fitting of the roller 42 is carried out to the pivot 76 of the trigger member 58, a roller 42 contacts the peripheral surface 62 of an inertial field 56, and rolling of the peripheral surface 62 of it is enabled with inertia migration of an inertial field 56. Moreover, the roller 42 and the above-mentioned roller 78 are countered, and the roller 44 is formed in the radial opposite hand of an inertial field 56. A roller 44 enters in the slot 46 formed along the inertia migration direction in the peripheral surface 62 of an inertial field 56, and contacts the bottom of a slot 46, and rolling of the bottom of a slot 46 of it is enabled with inertia migration of an inertial field 56. Inertia migration advice of the inertial field 56 is inserted and carried out between these rollers 42 and 78 and 44. While fitting of the roller 48 of a major diameter is carried out to the pivot 76 of the trigger member 58, furthermore, to the revolving shaft 88 of a roller 78 Fitting of the roller 49 of a major diameter is carried out. The rollers 48 and 49 of each major diameter It enters in the slot 47 formed along the inertia migration direction in the peripheral surface of an inertial field 56, and the bottom of the slot 47 is not contacted, but the revolution of the circumference of the inertia migration directional traverse of an inertial field 56 is prevented as entering in the above-mentioned roller 44 fang-furrow section 46, and \*\*\*\*. Moreover, when a slot 47 and the continuous slot 45 are formed in the back end side of an inertial field 56 and the trigger member 58 rotates counterclockwise by drawing 2, the roller 49 of a major diameter enters in a slot 45 without contacting the bottom of a slot 45 (drawing 3).

[0029] Even if a roller 49 will separate from the peripheral surface 62 of an inertial field 56 in rotation of the trigger member 58 and an inertial field 56 will be supported only with rollers 42 and 78, the angular moment based on the energization force of a helical compression spring 68 acts on an inertial field 56 so that an inertial field 56 may not be made to incline to the inertia migration direction.

[0030] Next, an operation of the above-mentioned example is explained. First, if it is in the usual car operation, the acceleration which acts on an inertial field 56 is small, in this case, the anti-inertia migration direction component of a force R based on the energization force by the helical compression spring 40 and the energization force F by the helical compression spring 68 cannot be opposed, but inertia migration of an inertial field 56 is prevented, and, as for a helical compression spring 68, an inertial field 56 achieves the function as the so-called bias spring with a helical compression spring in this case.

[0031] When the acceleration which acts on an inertial field 56 is large, an inertial field 56 resists the energization force by the helical compression spring, and the anti-inertia migration direction component of a force R, and carries out inertia migration.

[0032] Here, if the anti-inertia migration direction component of a force R has the large inertia movement magnitude L of an inertial field 56 when small and the inertia movement magnitude L becomes large as shown in drawing 4, the anti-inertia migration direction component of a force R will decrease gradually.

[0033] That is, the ratio to the energization force F of the anti-inertia migration direction component of a force R is determined by theta whenever [ crossed-axes-angle / to make / of the energization direction A and the anti-inertia migration direction B ], and becomes so small that theta becomes large whenever [ this crossed-axes-angle ]. Since theta becomes large according to the inertia movement magnitude of an inertial field 56 becoming large whenever [ crossed-axes-angle ], the ratio to the energization force F of the anti-inertia migration direction component of a force R becomes small according to the inertia movement magnitude of an inertial field 56 becoming large, and the inertia migration resistance which this part that becomes small, and an inertial field 56 receive is controlled according to the inertia movement magnitude of an inertial field 56 becoming

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large.

[0034] consequently, with the short acceleration of the acceleration reaction time which acts on an inertial field by the oscillation at the time of being hard to carry out inertia migration and a car running a bad road etc., an inertial field 56 at the beginning of inertia migration initiation The predetermined inertia movement magnitude which should start air bag equipment 10 cannot be reached. The predetermined inertia movement magnitude can be reached with the long acceleration of the acceleration reaction time which acts on an inertial field 56 by the car sudden slowdown which, on the other hand, needs to start air bag equipment 10 truly in order to take care of crew, and the damping function to slow down an inertial field 56 is achieved exactly.

[0035] In order to achieve a proper damping function, troublesome manufacture which asks the gap between an inertial field and a cylinder for close dimensional accuracy is not required, but easy structure is sufficient, and cheap-ization is achieved by this.

[0036] In addition, although the helical compression spring 40 was formed between the inertial field 56 and the base material 54 in addition to the helical compression spring 68 and the function as a bias spring has been obtained in the above-mentioned example, only a helical compression spring 68 can fully achieve the function as a bias spring.

[0037] Moreover, in the above-mentioned example, the end side of a helical compression spring 68 is held in the crevice 70. Although the part by the side of the end in a crevice 70 is the structure of not changing the flexible direction, but the part by the side of the other end which comes out outside from a crevice 70 and is stopped by projection 76 bending, changing the flexible direction, and changing theta whenever [ crossed-axes-angle / to make / of the energization direction A and the anti-inertia migration direction B ] A helical compression spring 94 like the acceleration sensor 92 shown in drawing 5 and drawing 6 , without forming the crevice 70 of the above-mentioned example The support block 96, From the inertia migration starting position which allots between the chamfers 100 formed in the front end side of an inertial field 98, and is shown in drawing 5 While an inertial field 98 carries out inertia migration linearly to the location which obtains the predetermined amount of migration inertia for starting the air bag equipment shown in drawing 6 , even if it makes it change covering the overall length of a helical compression spring 94, and making the flexible direction into the direction of a straight line, it is good natural.

[0038] Next, the 2nd example is explained based on drawing 7 and drawing 8 . In the acceleration sensor 101 of this example, an inertial field 102 The direction where it is formed in a L character mold, and a car cross direction and the crossover edge of both \*\*\*\* 104 and 106 cross at right angles from the short piece section 104 and the long piece section 106 by the pivot 108 made into shaft orientations It is supported to revolve by the support block 110 and it is supposed at the circumference of a pivot 108 between the location (location of drawing 7 ) where short \*\*\*\* 104 contacted the support block 110, and the location where the long piece section 106 contacts the support block 110 that it is rotatable. An inertial field 102 will carry out inertia migration clockwise by drawing 7 , if the acceleration to the car front is received. The compression spring 112 which constitutes an energization means is formed in an inertial field 102, the end of a helical compression spring 112 is held in the car front wall of housing 50, and the crevice 116 open for free passage, and contacts the front wall, and the other end is stopped by the projection 74 which projected in the center of the long piece section 106 of an inertial field 102. The energization direction A of the energization force F which a helical compression spring 112 exerts on an inertial field 102 is in the condition before inertia migration of an inertial field 102 (condition of drawing 7 ), serves as car back, and it crosses by theta whenever [ anti-inertia migration direction / of the inertial field 102 in the energizing point of the energization force F / B, and crossed-axes-angle ]. The anti-inertia migration direction component of a force R produced in the anti-inertia migration direction B based on the energization force F of a helical compression spring 112 is acquired by  $R=F \cdot \cos \theta$ , and this serves as inertia migration resistance to inertia migration of an inertial field 102.

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[0039] If an inertial field 102 carries out inertia migration in response to acceleration, according to the movement magnitude of an inertial field 102 becoming large, both the energization direction A of the energization force F and the inertia migration direction B of an inertial field 102 will change, and theta will become large whenever [ between both / crossed-axes-angle ] (refer to drawing 8 ).

[0040] Although a helical compression spring 112 contracts and the energization force F by the helical compression spring 68 increases in connection with an inertial field 102 carrying out inertia migration in response to acceleration By on the other hand becoming large according to the energization direction A becoming large [ the inertia movement magnitude of an inertial field 56 ] A ratio with the energization force F of the anti-inertia migration direction component of a force R becomes small, and, as for the anti-inertia migration direction component of a force R and the inertia movement magnitude of an inertial field 56, obtains the relation shown in the graph of drawing 4 like said 1st example.

[0041] Moreover, the swelling section 118 of 3 angle configuration is really formed in the car back side at the long piece section 106 of an inertial field 102. Through the top-most vertices of the swelling section 118, while is located and a side face 120 is formed in the shape of [ centering on a pivot 108 ] radii. The roller 78 of the trigger member 122 contacts that side face 120, and can be rolled with inertia migration of an inertial field 102. In this condition of contacting and rolling While counterclockwise rotation is prevented by drawing 7 of the trigger member 122, the rotation location of the trigger member 122 is held as it is, and engagement in the engagement section 86 and the flange section 82 of the firing pin 34 is maintained. If one side face 120 of the swelling section 118 separates from a roller 78, counterclockwise rotation is permitted by drawing 7 of the trigger member 122, and a roller 78 will roll the side face 128 of another side in which it is located through the top-most vertices of the swelling section 118, moving towards the other end from the end of a long hole 90. And the engagement section 126 separates with the flange section 82 of the firing pin 60, and migration behind [ car ] the firing pin 60 is permitted.

[0042] At this example, a roller for achieving the function as a bias spring to support an inertial field 102, since it is only a helical compression spring 112 and the inertial field 102 is supported free [ rotation ] by the pivot 108 is not required, and, as for this example and said 1st example, configurations differ on these each point.

[0043] Except for these, this example has the same configuration as said 1st example, and acquires the same operation effectiveness as said 1st example.

[0044] Furthermore, other examples are explained below. In the acceleration sensor 150 of the 3rd example shown in drawing 9 and drawing 10 , an energization means consists of flat spring 152, and this flat spring 152 is installed along the inertia migration direction of the inertial field 154 which carries out straight-line migration. The end by the side of the car back of flat spring 152 is fixed to the support block 156, the other end is crooked in an inertial field 154 side, and the pressure welding is elastically carried out to the chamfer 158 of the shape of radii formed in the front face of an inertial field.

[0045] Thereby, flat spring 152 makes the energization direction A cross by theta whenever [ anti-inertia migration direction / of an inertial field 154 / B, and crossed-axes-angle ], and exerts the energization force F of producing the anti-inertia migration direction component of a force R in the anti-inertia migration direction B on an inertial field 154.

[0046] If an inertial field 154 carries out inertia migration to the location which obtains the predetermined inertia movement magnitude for starting the air bag equipment shown in drawing 10 from the inertia migration starting position shown in drawing 9 , according to the inertia movement magnitude of an inertial field 154 becoming large, a bow configuration will carry out elastic deformation of the flat spring 152 towards a flat configuration, the pressure-welding location between a chamfer 158 and flat spring 152 will change, and theta will become large whenever [ above-mentioned crossed-axes-angle ].

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[0047] In the acceleration sensor 160 of the 4th example shown in drawing 11 and drawing 12, an energization means consists of torsion coil springs 162, while a torsion coil spring 162 makes the inertia migration direction of an inertial field 154, and the direction which intersects perpendicularly the direction of a rotation core and the short piece by the side of an end is fixed to the support block 156, the long piece by the side of the other end curves to an inertial field side, and the pressure welding of the long piece is elastically carried out to the chamfer 158 of an inertial field 154.

[0048] Thereby, a torsion coil spring 162 makes the energization direction A cross by theta whenever [ anti-inertia migration direction / of an inertial field 154 / B, and crossed-axes-angle ], and exerts the energization force F of producing the anti-inertia migration direction component of a force R in the anti-inertia migration direction B on an inertial field 154.

[0049] If an inertial field 154 carries out inertia migration to the location which obtains the predetermined inertia movement magnitude for starting the air bag equipment shown in drawing 12 from the inertia migration starting position shown in drawing 11 It follows that the inertia movement magnitude of an inertial field 154 becomes large. A torsion coil spring 154 While rotating in the direction which between the ends closes, and the long piece of the other end carries out elastic deformation towards a flat configuration from a bow configuration and changes the pressure-welding location between the other end and a chamfer 158, theta becomes large whenever [ above-mentioned crossed-axes-angle ].

[0050] The energization means is constituted from the acceleration sensor 170 of the 5th example shown in drawing 13 and drawing 14 by the plate-like part material 172 and the helical compression spring 174. The plate-like part material 172 is installed along the inertia migration direction of an inertial field 154, the end by the side of the car back of the plate-like part material 172 is supported to revolve by the support block 156, and rotation of it is attained by making into the direction of a rotation core the inertia migration direction of an inertial field 154, and the direction which intersects perpendicularly. The other end by the side of the car front of the plate-like part material 172 curves to an inertial field 154 side, a helical compression spring 174 intervenes between the plate-like part material 172 and a support block, and the pressure welding of the other end by the side of the car front of the plate-like part material 172 is elastically carried out to the chamfer 158 of an inertial field 154.

[0051] Thereby, the plate-like part material 172 and a helical compression spring 174 make the energization direction A cross by theta whenever [ anti-inertia migration direction / of an inertial field 154 / B, and crossed-axes-angle ], and exert the energization force F of producing the anti-inertia migration direction component of a force R in the anti-inertia migration direction B on an inertial field 154.

[0052] If an inertial field 154 carries out inertia migration to the location which obtains the inertia movement magnitude which should start the air bag equipment shown in drawing 14 from the inertia migration starting position shown in drawing 13, according to the inertia movement magnitude of an inertial field 154 becoming large, while a helical compression spring 174 is reduced, the plate-like part material 172 will carry out elastic deformation towards a flat configuration from a bow configuration, the pressure-welding location between the plate-like part material 172 and a chamfer 158 will change, and theta will become large whenever [ above-mentioned crossed-axes-angle ].

[0053] Whenever [ crossed-axes-angle / of the energization direction A of the energization force F and the anti-inertia migration direction B of an inertial field 154 which have the anti-inertia migration direction component of a force R in the anti-inertia migration direction B of an inertial field 154 ], theta becomes small according to the inertia movement magnitude of an inertial field 154 becoming large, and each of above 3rd thru/or 5th example is this limitation that becomes small, and does so the same operation effectiveness as the 1st example.

[0054] This invention is not limited to each above-mentioned example, and can be changed

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variously. For example, although a helical compression spring 174 and the plate-like part material 172 are used for helical compression springs 68, 94, and 112, flat spring 152, and torsion coil spring 162 list as an energization means in each above-mentioned example As long as it becomes large according to theta becoming large [ the inertia movement magnitude of an inertial field 54 ] whenever [ crossed-axes-angle / of the energization direction A of the energization force F instead of what is limited to these which attains to an inertial field 154, and the anti-inertia migration direction B which the anti-inertia migration direction component of a force R produces ], you may be other energization means.

[0055] Furthermore, it is [0056]. [ applicable not only to the air bag equipment for operators with which a steering wheel 18 is equipped but the equipment which starts PURIRODA in order to be in the air bag equipment for passenger seats, and other occupant crash protection other than air bag equipment, for example, webbing take-up motion, and to make it equip with webbing closely to crew at the time of a car sudden slowdown natural as occupant crash protection ]

[Effect of the Invention] Since it constituted as mentioned above, according to the acceleration sensor concerning this invention, although a proper damping function is obtained, close dimensional accuracy is not required too much, but easy structure is sufficient, and cheap-ization is achieved.



## 【特許請求の範囲】

【請求項1】 加速度作用によって慣性移動し所定の慣性移動量で車両急減速時に乗員保護装置を起動させる慣性体と、この慣性体に付勢方向を慣性体の反慣性移動方向と交差する方向とする付勢力を及ぼし付勢力に基づき慣性体の反慣性移動方向に慣性体の慣性移動に抵抗する分力を生じさせるとともに慣性体の慣性移動量が大きくなるのに従い慣性体に及ぶ付勢力の付勢方向と慣性体の反慣性移動方向とのなす交差角度が大きくなる付勢手段と、を備えたことを特徴とする加速度センサ。

## 【発明の詳細な説明】

## 【0001】

【産業上の利用分野】 本発明は、慣性体が加速度作用によって慣性移動し、所定の慣性移動量で車両急減速時に乗員保護装置を起動させる加速度センサに関する。

## 【0002】

【従来の技術】 車両の乗員保護装置としてはエアバッグ装置が知られている。

【0003】 エアバッグ装置は、車両急減速時に袋体が膨出し、膨出した袋体により乗員が保護されるようになっており、加速度センサは、エアバッグ装置を起動させるために用いられる。

【0004】 加速度センサでは、従来、ボールが慣性体とされてシリンダ内に収容され、ボールに加速度が作用すると、ボールがシリンダ内を慣性移動する。車両急減速時には、そのボールの所定の慣性移動量に基づき、着火ピンが雷管に向けて移動し、着火ピンが雷管と当接すると雷管が着火される。この雷管の着火によってガス発生物質が燃焼してガスが発生し、発生ガスが袋体内に供給されて袋体が膨出される。

【0005】 ここで、シリンダの内周面と、ボールの外周面との間には、間隙が形成されていて、ボールが慣性移動すると、その間隙には、ボールの慣性移動方向前方から後方に、ボールと相対的に空気が流れ、この空気の流れによってボールを減速させる減速抵抗、いわゆるダンピング抵抗が生ずる。これによれば、車両が悪路等を走行する際の振動等によってボールに作用する加速度作用時間の短い加速度では、ボールが着火ピンの移動に要する所定の慣性移動量に達せず、一方、乗員を保護するために真にエアバッグ装置を起動させる必要がある車両急減速によってボールに作用する加速度作用時間の長い加速度では、ボールが着火ピンの移動に要する所定の慣性移動量に達し、適正なダンピング機能が得られる。

## 【0006】

【発明が解決しようとする課題】 ところで、上記従来の加速度センサにあっては、シリンダの内周面と、ボールとの間の間隙の大きさが、ダンピング抵抗の大きさを左右する。従って、適正なダンピング機能を得るには、上記間隙に高い寸法精度が求められる。これは、製造が面倒であり、製造コストの上昇も招く本発明は上記事実を

考慮し、適正なダンピング機能を得るのに、過度に高い寸法精度を要せず、簡単な構造で足る低廉な加速度センサを提供することが目的である。

## 【0007】

【課題を解決するための手段】 本発明は、上記課題を解決するために、加速度作用によって慣性移動し所定の慣性移動量で車両急減速時に乗員保護装置を起動させる慣性体と、この慣性体に付勢方向を慣性体の反慣性移動方向と交差する方向とする付勢力を及ぼし付勢力に基づき慣性体の反慣性移動方向に慣性体の慣性移動に抵抗する分力を生じさせるとともに慣性体の慣性移動量が大きくなるのに従い慣性体に及ぶ付勢力の付勢方向と慣性体の反慣性移動方向とのなす交差角度が大きくなる付勢手段と、を備えたことを特徴とする加速度センサを提案するものである。

## 【0008】

【作用】 本発明に係る加速度センサによれば、付勢手段により慣性体に及ぶ付勢力に基づき、慣性体の反慣性移動方向に分力が生じ、この分力によって、慣性体の慣性移動が抵抗される。

【0009】 反慣性移動方向分力の付勢力に対する比は、付勢力の付勢方向と反慣性移動方向とのなす交差角度で決定され、この交差角度が大きくなるほど小さくなる。

【0010】 その交差角度は、慣性体の慣性移動量が大きくなるのに従って大きくなるので、反慣性移動方向分力の付勢力に対する比は、慣性体の慣性移動量が大きくなるのに従って小さくなり、この小さくなる分、慣性体が受ける慣性移動抵抗は、慣性体の慣性移動量が大きくなるのに従って抑制される。

【0011】 その結果、慣性体は、慣性移動開始当初、慣性移動し難く、車両が悪路等を走行する際の振動等によって慣性体に作用する加速度作用時間の短い加速度では、乗員保護装置を起動すべき所定の慣性移動量に達することができず、反面、乗員を保護するために真にエアバッグ装置を起動させる必要がある車両急減速によって慣性体に作用する加速度作用時間の長い加速度では、その所定の慣性移動量に達することができ、慣性体を減速するダンピング機能が適正に果たされる。

【0012】 これによって、適正なダンピング機能を得るのに、慣性体とシリンダとの間の間隙に高い寸法精度を求めるような面倒な製造を要せず、簡単な構造で足り、低廉化が果たされる。

## 【0013】

【実施例】 本発明の第1実施例に係る加速度センサを図1乃至図3に基づき説明する。

【0014】 図1(矢印F Rは、車両前方を示す)には、エアバッグ装置10が示されている。エアバッグ装置10は、インフレータ12、カバー14、袋体16で構成され、ステアリングホイール18のハブ20に支持

されたベースプレート22に取り付けられている。

【0015】インフレータ12は、ステアリングホイール18の回転軸線回りに外周面を有する円筒形状とされ、ベースプレート22を貫通して一部がベースプレート22の車両後方側(乗員側)に突出されている。

【0016】袋体16は、ベースプレート22の乗員側に折り畳まれた状態で設けられ、インフレータ12の乗員側突出部位が袋体16内に突入されている。

【0017】カバー14は、ベースプレート22との間に袋体16を格納するように碗状に形成されている。カバー14の底壁には、薄肉部24が形成され、袋体16が膨張すると、薄肉部24が破断されてカバー14が観音開きの態様で展開可能となっている。

【0018】インフレータ12には、エンハンサ26、雷管28、ガス発生物質30、加速度センサ32が収容され、車両急減速時には、加速度センサ32側の着火ピン34が雷管28と衝突して、雷管28が着火され、その着火によってガス発生物質30が伝火されてガスが発生し、ガスがインフレータ12のガス孔34を通って袋体16内に供給される。これによって、袋体16が乗員に向けて膨出され、乗員が保護される。

【0019】ここで、加速度センサ32について詳説する。加速度センサ32では、図2に示すように、ハウジング50内に支持ブロック54が配置され、支持ブロック54に、慣性体56、トリガ部材58、着火ピン34が支持されている。

【0020】慣性体56は、車両前後方向線回りに周面62を有する円柱形状とされ、慣性体56の後端面(車両後方端面)64が支持ブロック54に当接する位置(図2に示す位置)と、慣性体56の前端面(車両前方端面)66が支持ブロック54に当接する位置との間で、直線移動可能となっている。慣性体56は、車両前方への加速度を受けると、車両前方に向けて慣性移動する。

【0021】支持ブロック54と、慣性体56との間には、慣性体56の慣性移動方向前方斜めに、付勢手段を構成する圧縮コイルばね68が設けられている。圧縮コイルばね68による弾性的付勢力Fは、この付勢方向Aが慣性体56の反慣性移動方向(車両後方)Bと交差角度θで交差する方向とされて慣性体56に及んでいる。圧縮コイルばね68の一端は、支持ブロック54に形成された凹部70に嵌まり込んで凹部70の底に当接され、他端は、慣性体56に形成された切り欠き部72において突出した突起74に係止されている。圧縮コイルばね68による付勢力Fに基づき、慣性体56の反慣性移動方向Bには、慣性体56の慣性移動に抵抗する分力(反慣性移動方向分力R)が生ずる。この反慣性移動方向分力Rは、 $R = F \cdot \cos \theta$ で得られる。慣性体56が、加速度を受け、反慣性移動方向分力Rに抗して車両前方へ慣性移動すると、慣性移動量が大きくなるのに従

って、上記交差角度θが大きくなる(図2参照)。

【0022】慣性体56の慣性移動量が大きくなるのに従って、圧縮コイルばね68の縮小量が大きくなり、圧縮コイルばね68による付勢力Fが増すが、その一方、反慣性移動方向分力Rの付勢力Fに対する比は、付勢方向Aと反慣性移動方向Bとのなす交差角度θで決定され、この交差角度θが大きくなるほど小さくなる。

【0023】従って、図4に示すように、反慣性移動方向分力Rと慣性体56の慣性移動量Lとは、上記交差角度θが一定であれば反慣性移動方向分力Rが一定の比で増大する直線(点線で示す)的な関係となるのに対し、上記交差角度θが慣性体56の慣性移動量Lの大きくなるのに従って大きくなることにより、反慣性移動方向分力Rが最大値を得た後に減少するような曲線(実線で示す)的な関係となる。

【0024】なお、慣性体56の前端面66の一部には、車両前方へ若干量突出した突出部36が形成されるとともに、その突出部36に対向して支持ブロック54には、凹部38が形成され、突出部36と、凹部38の底との間には、圧縮コイルばね40が介在されている。圧縮コイルばね40による付勢力の付勢方向は、慣性体56の慣性移動量に関わらず反慣性移動方向Bとされる。慣性体56が慣性移動を開始し、そして慣性移動を続けるには、圧縮コイルばね40による付勢力に勝り、かつ、上記圧縮コイルばね66による付勢力に基づく反慣性移動方向分力Rに勝ることが必要である。

【0025】トリガ部材58は、板材で形成され、慣性体56の周面62に沿って車両前後方向に延設されている。トリガ部材58の車両前方側の一端は、慣性体56の慣性移動方向と直交する方向を軸方向とする支軸76で支持ブロック54に軸支されて、その支軸76回りに回動自在となっている。トリガ部材58の車両後方側の他端には、ローラ78が回転自在に設けられている。ローラ78は、慣性体56の周面62に当接して、慣性体56の慣性移動に伴い慣性体56の周面62を転動可能となる。ローラ78の慣性体56の周面62への当接によれば、トリガ部材58の図2で反時計方向への回動が阻止されるとともに、ローラ78が周面62を転動する間、トリガ部材58の回動位置はそのまま維持される。一方、慣性体56の慣性移動によって慣性体56の周面60がローラ78から外れた後は、トリガ部材58の図2で反時計方向の回動が許容される。

【0026】着火ピン34は、車両前方位置から車両後方位置へ移動可能とされ、車両後方側のピン部80と、車両前方側のつば部82とより構成されている。つば部82と支持ブロック54との間には圧縮コイルばね84が設けられて、着火ピン34は、車両後方へ常時移動付勢される。つば部82に対応して上記トリガ部材58には、係合部86が形成されている。トリガ部材58のローラ78が慣性体56の周面62に当接してトリガ部材

5 8 の反時計方向の回動が阻止された状態では（図2の状態）、係合部 8 6 は、つば部 8 2 と当接係合して圧縮コイルばね 8 4 の付勢力に対抗し、着火ピン 3 4 は、車両前方位置に保持されて後方への移動が阻止される。慣性体 5 6 の周面 6 2 がローラ 7 8 から外れて、トリガ部材 5 8 の反時計方向の回動が許容される状態では（図3の状態）、トリガ部材 5 8 の反時計方向の回動に伴い、係合部 8 6 とつば部 8 2 との係合が解除され、着火ピン 3 4 は、圧縮コイルばね 8 4 の付勢力に基づき車両後方位置への移動が許容され、ピン部 8 0 の先端がハウジング 5 0 外に出て雷管 2 8 に衝突する。

【0027】なお、ローラ 7 8 の回転軸 8 8 は、トリガ部材 5 8 に形成された円弧状の長孔 9 0 内に嵌合して、ローラ 7 8 が長孔 9 0 の長手方向に沿って移動可能となっている。ローラ 7 8 が慣性体 5 6 の周面 6 2 に当接して係合部 8 6 がつば部 8 2 と係合されているときは、圧縮コイルばね 8 4 の付勢力に基づきトリガ部材 5 8 が受ける回動付勢力によって、ローラ 7 8 は、長孔 9 0 の一端に位置される。慣性体 5 6 の慣性移動に伴い慣性体 5 6 の周面 6 2 がローラ 7 8 から外れると、ローラ 7 8 は、長孔 9 0 の他端に向けて移動しながら慣性体 5 6 の後端面 6 4 を転動し始め、慣性体 5 6 の周面 6 2 がローラ 7 8 から外れた後の慣性体 5 6 の僅かな慣性移動によって、あるいは、慣性体 5 6 の周面 6 2 がローラ 7 8 から外れた後直ちに、トリガ部材 5 8 は、係止部 8 6 とつば部 8 2 との係合が解除される回動位置まで回動する。これにより、係止部 8 6 とつば部 8 2 との係合の解除が節度よく行われる。

【0028】また、トリガ部材 5 8 の支軸 7 6 には、ローラ 4 2 が嵌合され、ローラ 4 2 は、慣性体 5 6 の周面 6 2 に当接して、慣性体 5 6 の慣性移動に伴い、その周面 6 2 を転動可能とされる。また、そのローラ 4 2 及び上記ローラ 7 8 に対向して、慣性体 5 6 の半径方向反対側には、ローラ 4 4 が設けられている。ローラ 4 4 は、慣性体 5 6 の周面 6 2 において慣性移動方向に沿って形成された溝部 4 6 内に入り込んで溝部 4 6 の底に当接し、慣性体 5 6 の慣性移動に伴い、溝部 4 6 の底を転動可能とされる。慣性体 5 6 は、それらローラ 4 2 、7 8 、4 4 間に挟まれて慣性移動案内される。更に、トリガ部材 5 8 の支軸 7 6 には、大径のローラ 4 8 が嵌合されるとともに、ローラ 7 8 の回転軸 8 8 には、大径のローラ 4 9 が嵌合され、各大径のローラ 4 8 、4 9 は、慣性体 5 6 の周面において慣性移動方向に沿って形成された溝部 4 7 内に入り込み、その溝部 4 7 の底には当接せず、上記ローラ 4 4 が溝部 4 6 内に入り込むと合俟つて、慣性体 5 6 の慣性移動方向線回りの回転が阻止されている。また、慣性体 5 6 の後端面には、溝部 4 7 と連続する溝部 4 5 が形成され、トリガ部材 5 8 が図2で反時計方向に回動したときに、大径のローラ 4 9 が、溝部 4 5 の底には当接しないで溝部 4 5 内に入り込むように

なっている（図3）。

【0029】トリガ部材 5 8 の回動にあたってローラ 4 9 が慣性体 5 6 の周面 6 2 から外れて、慣性体 5 6 が、ローラ 4 2 、7 8 のみで支持されることになつても、圧縮コイルばね 6 8 の付勢力に基づく回転モーメントが、慣性体 5 6 を慣性移動方向に対して傾斜させないように慣性体 5 6 に作用する。

【0030】次に上記実施例の作用を説明する。まず、通常の車両運転にあっては、慣性体 5 6 に作用する加速度が小さく、この場合には、慣性体 5 6 は、圧縮コイルばね 4 0 による付勢力と、圧縮コイルばね 6 8 による付勢力 F に基づく反慣性移動方向分力 R とに対抗できず、慣性体 5 6 の慣性移動が阻止され、この場合、圧縮コイルばね 6 8 は、圧縮コイルばねと共に、いわゆるバイアススプリングとしての機能を果たす。

【0031】慣性体 5 6 に作用する加速度が大きい場合には、慣性体 5 6 は、圧縮コイルばねによる付勢力と、反慣性移動方向分力 R とに抗して慣性移動する。

【0032】ここで、図4に示すように、慣性体 5 6 の慣性移動量 L が小さいときは、反慣性移動方向分力 R が大きく、慣性移動量 L が大きくなると、次第に反慣性移動方向分力 R が減少する。

【0033】すなわち、反慣性移動方向分力 R の付勢力 F に対する比は、付勢方向 A と反慣性移動方向 B とのなす交差角度  $\theta$  で決定され、この交差角度  $\theta$  が大きくなるほど小さくなる。交差角度  $\theta$  は、慣性体 5 6 の慣性移動量が大きくなるのに従って大きくなるので、反慣性移動方向分力 R の付勢力 F に対する比は、慣性体 5 6 の慣性移動量が大きくなるのに従って小さくなり、この小さくなる分、慣性体 5 6 が受ける慣性移動抵抗は、慣性体 5 6 の慣性移動量が大きくなるのに従って抑制される。

【0034】その結果、慣性体 5 6 は、慣性移動開始当初、慣性移動し難く、車両が悪路等を走行する際の振動等によって慣性体に作用する加速度作用時間の短い加速度では、エアバッグ装置 1 0 を起動すべき所定の慣性移動量に達することができず、反面、乗員を保護するために真にエアバッグ装置 1 0 を起動させる必要がある車両急減速によって慣性体 5 6 に作用する加速度作用時間の長い加速度では、その所定の慣性移動量に達することができ、慣性体 5 6 を減速するダンピング機能が的確に果たされる。

【0035】これによって、適正なダンピング機能を果たすために、慣性体とシリンドラとの間の間隙に高い寸法精度を求めるような面倒な製造を要せず、簡単な構造で足り、低廉化が果たされる。

【0036】なお、上記実施例では、慣性体 5 6 と支持体 5 4 との間に、圧縮コイルばね 6 8 に加えて圧縮コイルばね 4 0 を設けて、バイアススプリングとしての機能を得ているが、圧縮コイルばね 6 8 のみでも、バイアススプリングとしての機能を十分に果たせる。

【0037】また、上記実施例では、圧縮コイルばね68の一端側は凹部70内に収容されており、凹部70内にあるその一端側の部分は伸縮方向を変えず、凹部70から外部に出て突起76に係止される他端側の部分が揺んで伸縮方向を変えて、付勢方向Aと反慣性移動方向Bとのなす交差角度θを変化させる構造であるが、図5及び図6に示す加速度センサ92のように、上記実施例の凹部70を設けることなく、圧縮コイルばね94を、支持プロック96と、慣性体98の前端面に形成された面取り部100との間に配して、図5に示す慣性移動開始位置から、図6に示すエアバッグ装置を起動させるための所定の移動慣性量を得る位置まで慣性体98が直線的に慣性移動する間、圧縮コイルばね94の全長に亘ってその伸縮方向を一直線方向としたまま変化させるようにしても勿論よいものである。

【0038】次に、第2実施例を図7及び図8に基づき説明する。本実施例の加速度センサ101では、慣性体102は、短片部104と長片部106とよりL字型に形成され、両片部104、106の交差端が車両前後方向と直交する方向を軸方向とする支軸108で、支持プロック110に軸支され、短片部104が支持プロック110に当接した位置（図7の位置）と長片部106が支持プロック110に当接する位置との間で支軸108回りに回動可能とされる。慣性体102は、車両前方への加速度を受けると、図7で時計方向に、慣性移動する。慣性体102には、付勢手段を構成する圧縮ばね112が設けられ、圧縮コイルばね112の一端は、ハウジング50の車両前方壁と連通する凹部116内に収容されてその前方壁に当接し、他端は、慣性体102の長片部106の中央で突出した突起74に係止されている。圧縮コイルばね112が慣性体102に及ぼす付勢力Fの付勢方向Aは、慣性体102の慣性移動前の状態（図7の状態）で、車両後方となって、付勢力Fの付勢点における慣性体102の反慣性移動方向Bと、交差角度θで交差されている。圧縮コイルばね112の付勢力Fに基づき反慣性移動方向Bに生ずる反慣性移動方向分力Rは、 $R = F \cdot \cos \theta$ で得られ、これが慣性体102の慣性移動に対する慣性移動抵抗となる。

【0039】慣性体102が加速度を受けて慣性移動すると、慣性体102の移動量が大きくなるのに従って、付勢力Fの付勢方向Aと慣性体102の慣性移動方向Bとが共に変化し、両者間の交差角度θが大きくなる（図8参照）。

【0040】慣性体102が加速度を受けて慣性移動するのに伴い、圧縮コイルばね112が縮小して圧縮コイルばね68による付勢力Fは増すが、この一方で、付勢方向Aが慣性体56の慣性移動量の大きくなるのに従って大きくなることによって、反慣性移動方向分力Rの付勢力Fとの比が小さくなり、反慣性移動方向分力Rと、慣性体56の慣性移動量とは、前記第1実施例と同様

に、図4のグラフに示す関係を得る。

【0041】また、慣性体102の長片部106には、車両後方側に3角形状の膨出部118が一体形成されている。膨出部118の頂点を介して位置する一方の側面120は支軸108を中心とした円弧状に形成され、トリガ部材122のローラ78はその側面120に当接し、慣性体102の慣性移動に伴い転動でき、この当接して転動する状態では、トリガ部材122の図7で反時計方向の回動が阻止されるとともに、トリガ部材122の回動位置がそのまま保持され、係合部86と着火ピン34のつば部82との係合が維持される。膨出部118の一方の側面120がローラ78から外れると、トリガ部材122の図7で反時計方向の回動が許容され、ローラ78は、長孔90の一端から他端に向けて移動しながら、膨出部118の頂点を介して位置する他方の側面128を転動する。そして、係合部126が着火ピン60のつば部82と離れて、着火ピン60の車両後方への移動が許容される。

【0042】本実施例では、バイアススプリングとしての機能を果たすのが、圧縮コイルばね112だけであり、また、慣性体102が支軸108で回動自在に支持されているので慣性体102を支持するためのローラが必要でなく、これら各点で、本実施例と前記第1実施例とは構成が異なる。

【0043】これらを除いて本実施例は、前記第1実施例と同様な構成を有し、前記第1実施例と同様な作用効果を得る。

【0044】更に他の実施例を以下に説明する。図9及び図10に示す第3実施例の加速度センサ150では、付勢手段が板ばね152で構成され、この板ばね152は、直線移動する慣性体154の慣性移動方向に沿って延設されている。板ばね152の車両後方側の一端は、支持プロック156に固定され、他端は、慣性体154側に屈曲されて、慣性体の前面に形成された円弧状の面取り部158に、弾性的に圧接されている。

【0045】これにより、板ばね152は、付勢方向Aを慣性体154の反慣性移動方向Bと交差角度θで交差させて、反慣性移動方向Bに反慣性移動方向分力Rを生じさせる付勢力Fを慣性体154に及ぼす。

【0046】図9に示す慣性移動開始位置から、図10に示すエアバッグ装置を起動するための所定の慣性移動量を得る位置まで慣性体154が慣性移動すると、慣性体154の慣性移動量が大きくなるのに従って、板ばね152は、湾曲形状が平坦形状に向けて弾性変形し、面取り部158と板ばね152との間の圧接位置が変わって、上記交差角度θが大きくなる。

【0047】図11及び図12に示す第4実施例の加速度センサ1-6-0では、付勢手段がねじりコイルばね1-6-2で構成され、ねじりコイルばね1-6-2は、慣性体154の慣性移動方向と直交する方向を回動中心方向とし

て、一端側の短片が支持ブロック156に固定されるとともに、他端側の長片が慣性体側に湾曲されてその長片が慣性体154の面取り部158に、弾性的に圧接されている。

【0048】これにより、ねじりコイルばね162は、付勢方向Aを慣性体154の反慣性移動方向Bと交差角度θで交差させて、反慣性移動方向Bに反慣性移動方向分力Rを生じさせる付勢力Fを慣性体154に及ぼす。

【0049】図11に示す慣性移動開始位置から、図12に示すエアバッグ装置を起動させるための所定の慣性移動量を得る位置まで慣性体154が慣性移動すると、慣性体154の慣性移動量が大きくなるのに従って、ねじりコイルばね154は、その両端間が閉じる方向に回動するとともに他端の長片が湾曲形状から平坦形状に向けて弾性変形して、他端と面取り部158との間の圧接位置を変えながら、上記交差角度θが大きくなる。

【0050】図13及び図14に示す第5実施例の加速度センサ170では、付勢手段が、板状部材172と、圧縮コイルばね174とで構成されている。板状部材172は、慣性体154の慣性移動方向に沿って延設され、板状部材172の車両後方側の一端が支持ブロック156に軸支されて、慣性体154の慣性移動方向と直交する方向を回動中心方向として回動自在となる。板状部材172の車両前方側の他端は、慣性体154側に湾曲され、板状部材172と支持ブロックとの間には圧縮コイルばね174が介在して、板状部材172の車両前方側の他端が、慣性体154の面取り部158に弾性的に圧接されている。

【0051】これにより、板状部材172と圧縮コイルばね174とは、付勢方向Aを慣性体154の反慣性移動方向Bと交差角度θで交差させて、反慣性移動方向Bに反慣性移動方向分力Rを生じさせる付勢力Fを慣性体154に及ぼす。

【0052】図13に示す慣性移動開始位置から、図14に示すエアバッグ装置を起動すべき慣性移動量を得る位置まで慣性体154が慣性移動すると、慣性体154の慣性移動量が大きくなるのに従って、圧縮コイルばね174が縮小されるとともに板状部材172が湾曲形状から平坦形状に向けて弾性変形し、板状部材172と面取り部158との間の圧接位置が変化して、上記交差角度θが大きくなる。

【0053】上記第3乃至第5実施例はいずれも、慣性体154の反慣性移動方向Bに反慣性移動方向分力Rを有する付勢力Fの付勢方向Aと慣性体154の反慣性移動方向Bとの交差角度θが、慣性体154の慣性移動量が大きくなるのに従って小さくなり、この小さくなる限りで、第1実施例と同様な作用効果を奏する。

【0054】本発明は、上記各実施例に限定されるものではなく、種々変更可能である。例えば、上記各実施例では、付勢手段として、圧縮コイルばね68、94、1

12、板ばね152、ねじりコイルばね162並びに、圧縮コイルばね174及び板状部材172を用いているが、これらに限定されるものではなく、慣性体154に及ぶ付勢力Fの付勢方向Aと、反慣性移動方向分力Rが生ずる反慣性移動方向Bとの交差角度θが慣性体154の慣性移動量の大きくなるのに従って大きくなれば、他の付勢手段であってもよい。

【0055】更に、乗員保護装置としては、ステアリングホイール18に装着される運転者用のエアバッグ装置に限らず、助手席用のエアバッグ装置や、エアバッグ装置以外の他の乗員保護装置、例えば、ウェビング巻取装置にあって、車両急減速時にウェビングを乗員に対して緊密に装着させるためにブリローダーを起動する装置にも、勿論適用可能である

【0056】

【発明の効果】以上のように構成したので、本発明に係る加速度センサによれば、適正なダンピング機能を得るのに、過度に高い寸法精度を要せず、簡単な構造で足り、低廉化が果たされる。

【図面の簡単な説明】

【図1】本発明に係る第1実施例の加速度センサを適用したエアバッグ装置を、車両前後方向に沿って切断した断面図である。

【図2】本発明に係る第1実施例の加速度センサを、車両前後方向に沿って切断した断面図である。

【図3】図2において、慣性体がエアバッグ装置を起動すべき所定の慣性移動量を得た状態を示す図である。

【図4】慣性体に及ぶ付勢力に基づく反慣性移動方向分力と慣性体の慣性移動量との関係を示すグラフである。

【図5】第1実施例の変形例に係る加速度センサの要部を、車両前後方向と直交する方向から見た図である。

【図6】図5において、慣性体がエアバッグ装置を起動すべき所定の慣性移動量を得た状態を示す図である。

【図7】第2実施例の加速度センサを、車両前後方向に沿って切断した断面図である。

【図8】図7において、慣性体がエアバッグ装置を起動すべき所定の慣性移動量を得た状態を示す図である。

【図9】第3実施例の加速度センサの要部を、車両前後方向と直交する方向から見た図である。

【図10】図9において、慣性体がエアバッグ装置を起動すべき所定の慣性移動量を得た状態を示す図である。

【図11】第4実施例の加速度センサの要部を、車両前後方向と直交する方向から見た図である。

【図12】図11において、慣性体がエアバッグ装置を起動すべき所定の慣性移動量を得た状態を示す図である。

【図13】第5実施例の加速度センサの要部を、車両前後方向と直交する方向から見た図である。

【図14】図13において、慣性体がエアバッグ装置を起動すべき所定の慣性移動量を得た状態を示す図である。

る。

【符号の説明】

10 エアバッグ装置 (乗員保護装置)

32 加速度センサ

56 惯性体

A 付勢方向

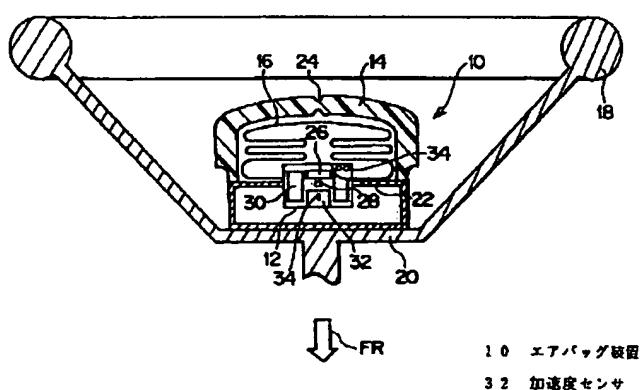
B 反慣性移動方向

F 付勢力

R 反慣性移動方向分力 (分力)

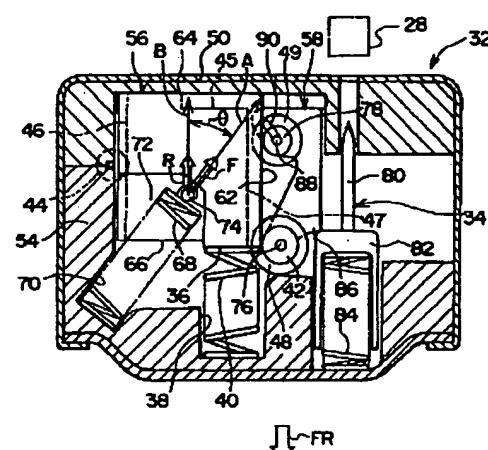
θ 交差角度

【図1】



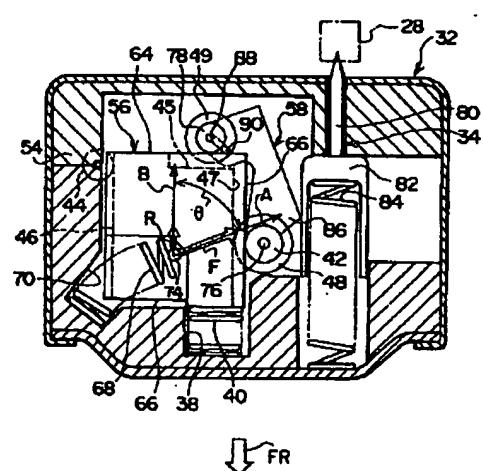
10 エアバッグ装置  
32 加速度センサ

【図2】

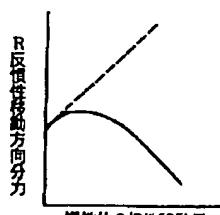


56 惯性体  
A 付勢方向  
B 反慣性移動方向  
θ 交差角度

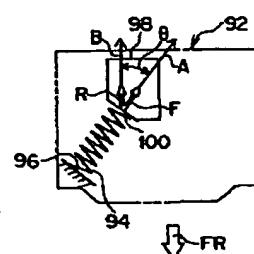
【図3】



【図4】

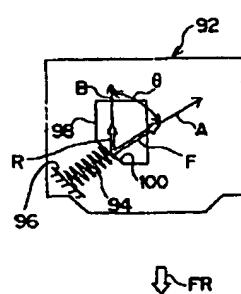


【図5】

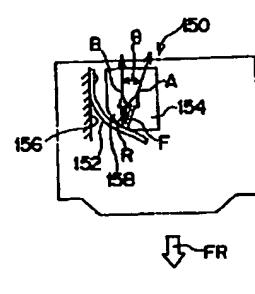


F 付勢力  
R 反慣性移動方向分力

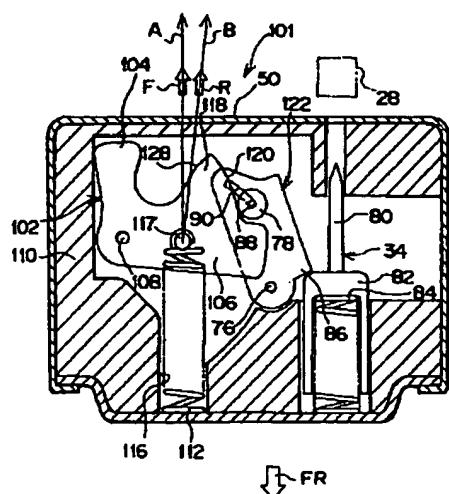
【図6】



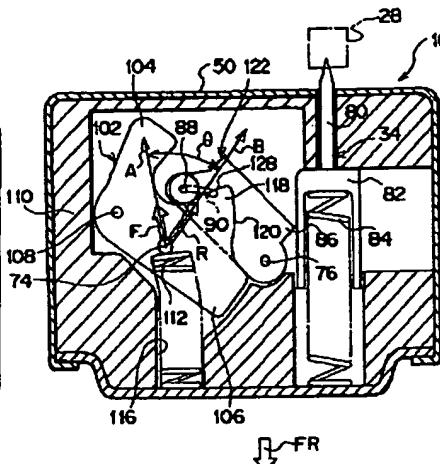
【図9】



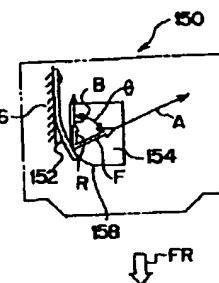
〔图7〕



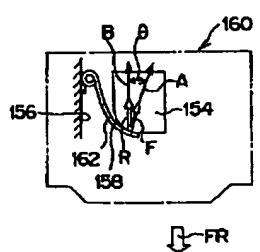
[図8]



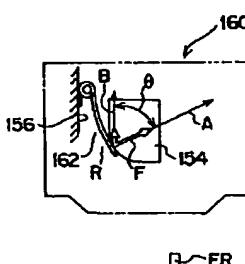
[四 10]



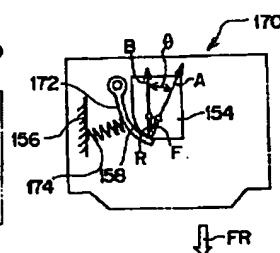
【 1 1】



【图12】



[図13]



【四 14】

